March 2021 edition

GMBl 2021 p. 582-598 [No 26] (of 4 May 2021)
(GMBl - Gemeinsames Ministerialblatt: Joint Ministerial Gazette

revised: GMBl 2022 p. 512 [No. 22] (of 1 July 2022)

Disclaimer: This translation is a courtesy translation (Status July 2022) and might not be updated regularly when minor adjustments in the original version are introduced.

Technical rules for hazardous substances	**Lead**	**TRGS 505**

The Technical Rules for Hazardous Substances (Technische Regeln für Gefahrstoffe - TRGS) reflect the state of the art in technology, occupational health and hygiene as well as other well-founded labour science findings related to activities involving hazardous substances including their classification and marking. They are drafted and/or amended by the

Hazardous Substances Committee

and published by the Federal Ministry of Labour and Social Affairs (BMAS) in the Joint Ministerial Gazette. These Technical Rules for Hazardous Substances define requirements from the Hazardous Substances Ordinance more specifically in the framework of its scope of application. Where the employer complies with the Technical Rules he can expect that the relevant requirements stipulated in the Ordinance are fulfilled. If the employer opts for another solution, he must attain at least the same level of safety and health protection for his workers.

Table of contents

1 Scope

2 Definitions

3 Information gathering and risk assessment

4 Protective measures

5 Preventive medical health care

6 Prohibitions of use

7 Employment restrictions

Annex 1: Guidance on the selection and implementation of protective measures and documentation in the risk assessment

Annex 2: Detailed technical and construction measures as well as other protective measures and rules

Annex 3: Removal of lead surface coatings on construction sites

Annex 4: Model operating instructions in accordance with the Hazardous Substances Ordinance

References to background reading

Table of contents

1	Scope of application	2
2	Definitions	3
3	Information gathering and risk assessment	3
3.1	Informationa gathering	3
3.2	Risk assessment	5
4	Protective measures	6
4.1	Order of priority of protective measures	6
4.2	Procedure for the choice and implementation of protective measure	7
4.3	Protective measures for company practice	7
4.4	Technical measures	7
4.5	Organisational measures	8
4.6	Personal protective equipment	8
4.7	Personal hygiene measures	10
4.8	Instruction of workers	11
5	Preventive occupational health care	12
6	Prohibtions of use	12
7	Employment restrictions	13
Annex 1 to Technical Rule for Hazardous Substances 505		14
Annex 2 to Technical Rule for Hazardous Substances 505		15
Annex 3 to Technical Rule for Hazardous Substances 505		20
Annex 4 to Technical Rule for Hazardous Substances 505		24
References to literature		25

1 Scope of application

(1) The Technical Rule for Hazardous Substances 505 is addressed to the employer and contains special protective measures for activities involving lead, inorganic lead compounds and lead mixtures in order to stay below the biological limit value (Biologischer Grenzwert - BGW) of 150 µg lead/L blood applicable in Germany. This value does not apply to workers of child-bearing age. The provisions of the Maternity Protection Act remain unaffected. Employment restrictions are listed in division 7, prohibitions on use in division6.

(2) The provisions of this Technical Rule for Hazardous Substances apply to lead-containing mixtures with a lead content of > 0.3% by weight and lead-containing mixtures in powder form with a particle diameter of < 1 mm by weight with a lead content of > 0,03% by weight.

(3) The Technical Rule for Hazardous Substances 505 does not apply to activities falling within the scope of Technical Rule for Hazardous Substances 524 “Protective measures against activities in contaminated areas”.

(4) The Technical Rule for Hazardous Substances 505 does not apply to lead alkyls and mixtures thereof and to the other organic lead compounds named in Annex VI to Regulation (EC) No 1272/2008 (CLP Regulation).

(5) The primary objective of this Technical Rule for Hazardous Substances is to minimise exposure to lead and lead compounds by means of suitable technical, organisational and personal protective measures.

2 Definitions

(1) The terms used in this Technical Rule for Hazardous Substances are used as defined in the "Glossary of the rules contained in the Industrial Safety Ordinance (Betriebssicherheitsverordnung - BetrSichV), the Biological Agents Ordinance (Biostoffverordnung - BioStoffV) and the Hazardous Substances Ordinance (Gefahrstoffverordnung - GefStoffV)".

(2) Lead and lead compounds are used as a comprehensive term for lead, inorganic lead compounds and lead-containing mixtures in this Technical Rule for Hazardous Substances.

3 Information gathering and risk assessment

3.1 Information gathering

(1) In the case of activities involving lead and lead compounds, it has to be observed that only part of the individual burden on workers is caused by inhalation of lead dusts and lead fumes. Despite a low concentration of lead in the ambient air at the workplace, the biological limit value may be exceeded. A significant part of the load can be caused by oral intake through hand-to-mouth contact due to a lack of hygiene, while dermal intake can be neglected. Hygiene includes cleanliness in the company and personal cleanliness as well as individual behaviour.

(2) The "Explanatory statement for lead in TRGS 903" [6] indicates that the lead content in the blood in exposed workers is insufficiently correlated with lead in the ambient air at the workplace, so that an occupational exposure limit value in the air cannot be reliably derived. Therefore, no own occupational exposure limit value in the air is set in Germany.

(3) The binding air limit of 150 µg lead/m³ applicable in accordance with Directive 98/24/EC is therefore the maximum limit in the air at the workplace. This value is not health-based and does not correspond to the state of the art in science and technology. There is no correlation between air measurement readings and impact data. Furthermore, the action level of the Ordinance on Preventive Occupational Healthcare (Verordnung zur arbeitsmedizinischen Vorsorge - ArbMedVV) is not a health-based air concentration for mandatory healthcare either.

(4) In order to assess exposure and to assess the need for further protective measures, it is necessary to examine the implementation of the state of the art. All exposure routes into must be taken into account.

(5) However, the measurement of air concentration can contribute to identifying a reference value in order to:

1. detect changes in working conditions at an early stage and to take timely countermeasures in the event of increasing concentrations,
2. monitor the effectiveness of technical measures and
3. determine whether the employer is obliged to arrange for mandatory health care in accordance with the Ordinance on Preventive Occupational Healthcare.

(6) According to the current state of knowledge, activities involving lead and lead compounds include in particular:

1. melting of lead ore and lead concentrates (primary melting of lead),
2. recycling of lead-containing waste and secondary raw materials (primary/secondary lead melting),
3. refining of lead,

4. transporting, storing and stacking of lead in bars, sheets, rods, used batteries, etc.,
5. loading and driving away lead dross, ashes or other dusty material as well as emptying the containers,
6. handling and loading lead compounds in(to) closed containers,
7. production and processing of leaded bronze, lead pigments, lead glazes, lead powder and dusting lead compounds;
8. use of powdered lead compounds in the manufacture of paints (restoration), electronic components (piezoceramics), sintered parts, accumulators and plastic objects,
9. melting and casting of lead and lead alloys,
10. manufacture, transport and installation of charge carriers in the accumulator industry,
11. production, melting and casting of lead-containing alloys such as free cutting steel, copper alloys, etc.,
12. Processing of lead and lead alloys by mechanical (e.g. grinding, brushing, polishing and blasting) or thermal processes,
13. heat treatment of steel wires and strips,
14. homogeneous lead coating,
15. manufacture of lead projectiles,
16. repair, cleaning and revision work in sectors and areas where lead is produced, processed or used,
17. soft soldering with lead-containing solders,
18. manufacture and working of organ pipes,
19. the use of lead for bending bells for the manufacture of brass instruments,
20. roof coverings with lead-containing materials,
21. painting of glass, lead glazing (especially when restoring historical lead glazing),
22. applying lead-containing decorative paints on enamel, glass and ceramics in the form of pastes or solidified thermoplastics,
23. processing of pastes with lead-containing pigments and lead-containing decorative paints as screen print pastes or thermoplastics,
24. preparing and inserting leaded glass mixtures,
25. applying lead-based coating material (restoration) or other lead-based products in spray processes,
26. using lead-based explosives (ammunition and special explosive material), monitoring of shooting drill with lead-containing ammunition and cleaning of sites (including shooting ranges) where lead-containing materials were used,
27. removal of lead-containing coatings, e.g. by burning off, by abrasive processes (e.g. brushing, grinding, polishing, blasting and needling) or by paint stripping,
28. removing lead-containing components or lead-containing building materials during the renovation or demolition of buildings,
29. welding and flame cutting of metal parts with lead-containing coatings,

30. disassembly of lead-containing waste equipment (e.g. electrical and electronic equipment).

(7) In addition to workers of a company, other groups of persons should be involved in the gathering of information and risk assessment (see division 4.2 (3)). These include, for example:

1. external maintenance staff and craftsmen,
2. cleaning staff,
3. workers working in the framework of temporary agency work,
4. workers in laundry transport services and in laundries for lead-contaminated textiles,
5. cleaning staff for respiratory protective equipment and other personal protective equipment.

(8) Furthermore, the cooperation arrangements between various firms in accordance with section 15 of the Hazardous Substances Ordinance regarding skills, mutual information and coordination apply.

3.2 Risk assessment

(1) The risk assessment is to be carried out by experts.

(2) The employer has to examine and document whether lead and lead compounds can be dispensed with. This substitution check must relate to lead and lead compounds and to work procedures. Where technically appropriate alternatives exist, they have to be applied.

(3) For all activities involving lead and lead compounds, in particular those listed in division 3.1 (2) and (3), a risk assessment is to be carried out by the employer in accordance with section 6 of the Hazardous Substances Ordinance, taking particular account of the substance-specific risks and the routes for the intake of lead.

(4) In the case of activities involving lead and lead compounds, the specific protective measures are to be determined as a result of the risk assessment in accordance with section 6 of the Hazardous Substances Ordinance. It has also to be taken into account that if the biological limit value is complied with, a risk to the unborn child cannot be ruled out. Reference is made to the provisions on special groups of persons in division 7.

(5) In the event of cooperation between several companies, the companies (clients and contractors) have to act together and coordinate protective measures.

(6) If activities involving lead and lead compounds are carried out in accordance with a process- and substance-specific criterion according to the Technical Rule for Hazardous Substances 420 (see list of process- and substance-specific criteria recognised by the Hazardous Substances Committee as standardised working and substances procedures), it can be assumed that the requirements of the Hazardous Substances Ordinance are being implemented to protect workers.

(7) In the risk assessment the possible contamination of working clothes and protective clothing and work equipment and the possible spreading of contamination to safe areas is to be taken into account.

(8) The effectiveness of technical, organisational and personal protective measures is to be reviewed. The aim is to undercut the biological limit value.

(9) The effectiveness of technical protection measures can be regularly reviewed, in

particular by measuring the concentration of lead in ambient air at work, see division 3.1 paragraphs 2 to 5 and the references to literature [12].

(10) In the context of the identification and assessment of the risks and the effectiveness check, the findings from occupational preventive health care within the meaning of section 6 (4) of the Ordinance on Preventive Occupational Healthcare, in particular from biomonitoring, are to be taken into account. However, the employer cannot derive the right to have access to the results of individual medical check-ups from this requirement. Occupational health analyses of biological material must take account of the state of the art and the quality criteria (see Occupational Medical Rule [Arbeitsmedizinische Regel - AMR] 6.2).

(11) The involvement of the occupational health physician in the risk assessment is in principle necessary because of the particular importance of biomonitoring. The involvement of the physician may vary depending on the circumstances, ranging from written or oral statements to the preparation of the risk assessment on behalf of the employer (see Occupational Medical Rule 3.2.). The main focus of the occupational health physician's involvement in the risk assessment is the application of his/her occupational health expertise. The physician advises the employer in particular on

1. acute and chronically damaging properties of lead and lead compounds,
2. exposure routes,
3. the importance of the workload in assessing the inhalation burden,
4. hygiene,
5. preventive medical check-ups and, in particular, the importance of biomonitoring,
6. personal protective equipment and the burden caused by wearing personal protective equipment,
7. illicit activities and working conditions for specific groups of persons (see division 7).

(12) If the risk assessment and findings from preventive occupational healthcare show that there is no exposure to lead and lead compounds in activities, no additional measures are required in accordance with these Technical Rules for Hazardous Substances. No exposure means that lead in ambient air measured with the standard method for analysing lead and lead compounds according to German Statutory Accident Insurance information 213-573 is below the limit of determination, that there is no dermal or oral exposure and that no contamination with lead or lead compound is possible, e.g. through the worker's working clothes. This may be the case, for example, with the machining of lead alloys such as free cutting steel rods or copper alloys using cooling lubricants.

4 Protective measures

4.1 Order of priority of protective measures

The order of priority of protective measures at the workplace is laid down in section 7 (4) of the Hazardous Substances Ordinance. Division 4 of the Hazardous Substances Ordinance and sections 8 to 15 govern the protective measures to be taken. Details of the necessary protective measures for activities involving lead and lead compounds are set out in Divisions 4.3 to 4.8 and in Annexes 2 and 3 to this Technical Rule for Hazardous Substances. Because of the knowledge of the influence of personal behaviour and hygiene on the intake of lead into the body, it is necessary and of particular importance, in addition to technical and general organisational measures, to determine individual protective and behavioural measures

providing for requirements for personal protective equipment and personal hygiene.

4.2 Procedure for the choice and implementation of protective measures

(1) If the risk assessment, including the substitution check, reveals that the protective measures already taken are insufficient, the further procedure for minimising exposure are to be described on an activity-related basis. To this end, the technical, organisational and personal protective measures to minimise exposure in the working area must be stated. The aim of minimising exposure is to reduce the blood lead level for occupationally exposed workers, to undercut the biological limit value and to avoid exposure to lead for previously unexposed workers. The reduction of the blood lead level to below the biological limit value may vary widely even after exposure has ended and may require a period of several years. The risk assessment is to be reviewed regularly, but at least once a year, and adjusted, if necessary, taking into account in particular the period during which an effective reduction in blood lead concentration can be achieved.

(2) Guidance on how to proceed to reduce exposure is enclosed in Annex 1. It is recommended that measures and the time period for implementing the minimisation of exposure be documented and coordinated with the authority responsible for occupational safety and health.

4.3 Protective measures for company practice

(1) A link between the blood lead level and the lead concentration in the respiratory air cannot be established if workplace concentrations are low. Once technical protective measures have been exhausted, the possibilities for further reducing the level of blood lead lie largely in the continuous improvement of internal organisation and personal hygiene systems, as well as of the optimised use of personal protective equipment.

(2) Divisions 4.4 to 4.7 list various measures and behaviours that have already proved their worth in company practice in order to sustainably reduce exposure to lead. These measures are to be considered and applied to all activities involving lead and lead compounds, in particular those listed in division 3.1 (2), in accordance with the hierarchy of measures (S-T-O-P: substitution, technical measures, organisational measures and personal and behavioural measures).

4.4 Technical measures

(1) Where it is not possible to avoid the emergence and release of dusts, technical protective measures according to the state of the art are to be applied as a matter of priority. In the following, technical protective measures are listed according to decreasing effectiveness:

1. enclosed machinery and installations with integrated dust handling (e.g. closed rather than open transport systems),
2. machinery with extraction system at the source of emissions,
3. extraction system at the workplace, as close as possible to the source of emissions,
4. room ventilation systems with the arrangement of extraction ventilation components as close as possible to the source of danger, in order to obtain the highest possible local air exchange rate in these areas and
5. room ventilation providing for an even ventilation of the room.

(2) For the ventilation systems and equipment, proof of sufficient effectiveness is to be provided at the time of initial entry into service and during periodic tests. Air extracted from the working area must not be returned to the working area. This does not apply if the air has been

adequately decontaminated of such substances using processes or devices recognised by the authorities or the statutory accident insurance (section 10 (5) of the Hazardous Substances Ordinance).

(3) In view of the wide variety of activities in the industrial, commercial and craft sectors, Annex 2 to this Technical Rule for Hazardous Substances contains detailed technical and structural measures as well as other protective measures and rules specific to the activities listed in division 3 in a matrix or are to be applied according to the state of the art (in accordance with Technical Rule for Hazardous Substances 460). These measures are to be applied as a matter of priority unless it can be proven that other measures taken can undercut the biological limit value while also taking into account more recent findings. Annex 3 contains additional measures to be observed when decoating work is carried out on construction sites, as special conditions prevail there.

4.5 Organisational measures

4.5.1 Workers' skills

(1) Activities involving lead and lead compounds may only be carried out by qualified or specially trained persons.

(2) Because of the high level of risk involved in carrying out activities within the meaning of this Technical Rule for Hazardous Substances, workers must be able to carry out the work properly and safely and to use the safety equipment correctly.

4.5.2 Cleaning of workplaces/working areas

(1) Workplaces are to be cleaned by vacuuming or by wet cleaning.

(2) Blowing or sweeping the dust off without using dust-binding measures (e.g. sweeping chips, moisturising, etc.) is prohibited.

(3) Workplaces/working areas are to be provided with the necessary cleaning resources. Depending on the workplace/working area, measures like wet cleaning (water hose and washing brush) or dry cleaning (industrial vacuum cleaner class "H" according to DIN EN 60335-2-69/dust extractor) may be used.

4.5.3 Communal rooms (changing rooms, washing rooms and break rooms)

(1) Contaminated and uncontaminated areas of changing rooms have to be strictly separated (black and white principle). Separate changing rooms – separated by washing rooms – are to be sought. This separation must be implemented in new plants. The frequency of cleaning of lockers is to be determined in accordance with the risk assessment. In practice, cleaning with a wet cloth has proven its worth once a week on the outside and at least once a year on the inside.

(2) It is not permitted to enter canteen and break rooms with lead-contaminated clothing or footwear. This can be achieved, for example, by changing working clothes, vacuuming working clothes, wearing clean coats and using disposable shoe covers.

(3) Changing rooms, washing rooms and break rooms (including furniture) are to be cleaned wet daily. In order to ensure proper cleaning, a cleaning plan must be drawn up and the appropriate and professional implementation must be checked and documented.

4.6 Personal protective equipment

(1) It has to be determined in the framework of the risk assessment whether and what personal protective equipment is to be selected, provided and used by all exposed persons in activities involving lead and lead compounds. If the effectiveness check in the context of the

risk assessment reveals that exposure of workers cannot be ruled out in the case of activities involving lead and lead compounds, e.g. if it is found that the biological limit value has been exceeded, hygiene conditions must be checked and, where appropriate, the type of PPE adapted.

(2) If the risk assessment reveals the need to wear respiratory protective equipment, the employer must select and provide it in accordance with German Statutory Accident Insurance rule 112-190. It has to be worn by the workers, taking into account the recommendations on the limitation of wearing time set out in division 3.2.2 in conjunction with Annex 2 to the German Statutory Accident Insurance Rule 112-190. When selecting respiratory protection equipment, it must be checked whether lead fumes or lead dusts are released during the activities. Reusable respiratory protection equipment in accordance with paragraph 5 is to be provided as a matter of priority. Depending on how long and how often the activity is performed, the risk assessment may reveal that FFP2 or FFP3 masks provide sufficient protection. The risk assessment and the operating instructions have to specify and document for which activities and in which working areas respiratory protective equipment is required, as well as the question which type of respiratory protective equipment should be used and for how long it may be worn.

(3) It is necessary to ensure that respiratory protective equipment or helmets are not stored in contaminated areas.

(4) The order in which PPE has to be taken off has to be laid down in the risk assessment according to the hazard so as to minimise contamination, e.g. the lead-contaminated protective gloves are to be taken off first and the respiratory protection device next.

(5) Reusable respiratory protection devices, such as externally ventilated helmets and half masks made of rubber, are to be cleaned, checked and, where necessary, repaired or replaced after use by a qualified person. The qualified person must have sufficient knowledge of the respiratory protective equipment and must be able to assess and maintain safe working condition of the respiratory protective equipment (see German Statutory Accident Insurance Rule 112-190).

(6) Dry and dust-free storage of all PPE is to be ensured. Suitable compartments in lockers or points where respiratory protective equipment can be picked up, have to be provided.

(7) Where protective helmets are worn in areas contaminated with lead, they must be cleaned wet regularly (at least once per shift) from the inside and the outside.

(8) The following exception may apply to workers, external companies and small establishments who/which are only occasionally present in areas contaminated by lead as part of a temporary work assignment: Lightweight disposable overalls providing dust tightness, e.g. chemical protective clothing resistant to penetration by airborne solid particles (Type 5) (according to DIN EN ISO 13982-1:2011-02 and DIN EN 13982-2:2005-03), may be used if this is possible due to the risk assessment, e.g. for cleaning work in filter systems. Disposable overalls prevent the working clothes worn under them from being contaminated. Due to the lack of air circulation and the poor wearing comfort, disposable overalls are not to be used permanently. Sufficient breaks per assignment must be granted (in accordance with the risk assessment). Wearing a disposable overall does not eliminate the obligation to clean the entire body at the end of the working day.

(9) The professional disposal of disposable overalls and disposable masks is to be ensured in the establishment.

(10) It is necessary to draw up operating instructions for the use of the PPE, which also serve as a basis for the instruction of workers.

4.7 Personal hygiene measures

4.7.1 General hygiene rules

Experience in activities involving lead and lead compounds shows that personal hygiene requirements and strict adherence to them have the greatest impact on reducing blood lead contamination. The following hygiene rules must be complied with:

1. After the end of the activity involving lead and before each break (including cigarette breaks), workers must always wash their hands, arms and faces, rinse their mouths or brush their teeth. The employer must provide the necessary hygiene items for this purpose. Hands and face must also be washed before the use of sanitary facilities and, where appropriate, protective clothing must be taken off carefully so as to prevent release of lead dust,

2. Objects for personal and private use (cigarettes, including e-cigarettes, mobile phones, watches, jewellery, bags, etc.) are not permitted in the areas contaminated by lead. Suitable, safe compartments in lockers must be made available to workers for these objects. These compartments must be cleaned in accordance with the requirements of the risk assessment. Cleaning of the inside is to be carried out at least once a year. Cleaning must be documented,

3. All workers in lead contaminated areas must shower at the end of the shift/working day,

4. Workers must be given sufficient time during working hours to comply with the hygiene rules,

5. In addition to the appropriate washing facilities, wet wipes (e.g. to wipe sweat) must be provided for the cleaning of face and hands.

4.7.2 Working clothes

(1) In the case of activities likely to result in increased contamination of the clothing by lead dusts, the employer has to provide working clothes (including underwear and socks, based on the degree of exposure).

(2) The employer has to ensure that the working clothes are cleaned by appropriate cleaning services.

(3) A sufficient supply of clean working clothes has to be at the disposal of all workers who work in areas with exposure to lead so that they can change their working clothes on a daily basis and, if necessary, more often when exposed to high pollution.

(4) Clean working clothes and PPE have be kept separate from used working clothes and used PPE.

(5) Used working clothes must be left in the black area for cleaning and may not be taken home. As for workers, external enterprises and small establishments working in the framework of a temporary work assignment in areas heavily exposed to lead (e.g. during maintenance and cleaning work), disposable overalls can be made available to protect working clothes from contamination, which must be taken off as safely as possible after work and disposed of professionally at the work location.

4.7.3 Food, beverages and tobacco

(1) Eating, drinking, chewing chewing gum, smoking and snuffing of tobacco is prohibited in the areas exposed to lead. Keeping food or beverages in areas exposed to lead is also not permitted.

(2) Any food consumption is only permitted in the designated areas with clean work clothes

(see division 4.5.3 (2), after workers wash their hands and rinse out their mouths. Measures for oral hygiene (e.g. brushing teeth) are to be derived from the risk assessment. Appropriate tools (e.g. toothbrushes, toothpaste) are to be provided by the employer.

(3) Spaces for smoking and for the consumption of beverages are to be designated bindingly and must be located outside areas exposed to lead.

(4) Where spaces for short breaks are set up in areas exposed to lead, they may not be used for food consumption, but only for washing hands and face and for drinking. The employer has to provide and, if necessary, renew hygiene items, water or other beverage dispensers or bottled beverages in these rooms.

4.8 Instruction of workers

(1) The employer has to instruct workers about safe working methods in connection with activities involving lead and lead compounds. Content, form and language of the instruction for workers are set out in section 14 of the Hazardous Substances Ordinance in conjunction with the Technical Rule for Hazardous Substances 555. The substance-specific information and instruction is to be provided mainly based on this Technical Rule for Hazardous Substances and the operational instructions describing the risks and the corresponding protective measures for activities involving lead and lead compounds. An example of operating instructions for activities involving lead and lead compounds are set out in Annex 4.

(2) Initial instruction (prior to taking up work) should include the following content:

1. risks to health and the environment posed by lead and lead compounds;
2. necessary protective measures and hygiene rules, including
    a) the use and inspection of exhaust equipment,
    b) cleaning of working area, workplace and work equipment,
    c) proper use and inspection of personal protective equipment,
    d) rules for working clothes,
    e) hygiene rules, e.g. before eating or drinking,
    f) behaviour in the event of danger and incidents,
    g) first aid measures,
    h) proper disposal of waste containing lead.

(3) Furthermore, an important part of the instruction is the general occupational medical and toxicological advice including the explanation of the occupational medical precautions and in particular the biomonitoring (see paragraph 6).

(4) Follow-up instruction (at least annually) includes:

1. repetition of initial instruction,
2. changes in operation,
3. address adjustment of behaviour.

(5) Additional instruction is to be provided depending on the results of preventive occupational health care, taking into account Occupational Medical Rule 6.4.

(6) The employer must ensure that employees receive general occupational medical and toxicological advice as part of the instruction with the involvement of the physician responsible for preventive occupational health care. The involvement of the physician responsible for

preventive occupational health care does not necessarily mean that the physician always provides the counselling in person. The requirement to participate can be fulfilled, for example, by providing medical training for the persons carrying out the instruction or by helping to produce suitable instruction materials (see Occupational Medical Rule 3.2). During the counselling, workers must be informed in a manner that is understandable to the non-expert of the possible health consequences of the hazard and its prevention, including emergency measures, and of their entitlement to preventive occupational health care.

(7) The counselling has to take into account the findings of division 5.2.2 of the German Society for Occupational Medicine and Environmental Medicine (DGAUM) S1 Guideline. In particular the following points should be addressed:

1. intake usually takes place via the respiratory tract, but also via the gastrointestinal tract,
2. lead is not absorbed through intact skin,
3. biomonitoring for lead is available and recommended,
4. personal values are subject to medical confidentiality,
5. in addition to technical protection measures the blood lead level depends crucially on personal hygiene (see division 4.7),
6. smoking with contaminated hands (and clothes) leads to significantly increased intake of lead in the body,
7. increased lead levels may disturb blood formation and a persistent anemia may arise and fatigue, listlessness and pallor may indicate a lead-induced anemia,
8. lead is stored, inter alia, in the bones, from where it can only be extracted with difficulty and can therefore generate exposure for years,
9. lead can cause chronic, non-curable damage to kidneys, gum and teeth,
10. lead affects fertility and damages the unborn child,
11. increased blood-lead levels persistently impair men’s reproductive capacity,
12. lead may cause severe and non-reversible nerve damage with palsies.

(8) Other employer obligations to provide information are regulated in sections 13, 14 and 15 of the Hazardous Substances Ordinance. Section 6 of the Ordinance on Preventive Occupational Healthcare refers to the obligations of the occupational physician to provide counselling and information.

5 Preventive medical health care

Preventive occupational health care is governed by the Ordinance on Occupational Health Care and the pertinent Occupational Medical Rules issued hereto.

6 Prohibitions of use

(1) lead chromate, C.I. pigment yellow 34 and C.I. Since 21 May 2018, pigment red 104 may no longer be used without a granted authorisation (2006/1907/EC, REACH Annex XIV, entries 10 to 12).

(2) The use of lead in jewellery or parts of jewellery exceeding 0.05% by weight is prohibited (2006/1907/EC, REACH Annex XVII, entry 63).

(3) The use of lead and lead compounds in electric and electronic equipment above a maximum concentration of 0.1% in homogeneous materials is prohibited (2011/65/EC, RoHS, defined exceptions in Annexes III and IV).

(4) The use of lead and lead compounds as a material and in components of vehicles placed on the market after 1 July 2003 is prohibited (2000/53/EC, ELV; defined exceptions in Annex II, e.g. for lead in batteries).

(5) The use of lead and lead compounds in cosmetic products is prohibited (1223/2009/EC, Cosmetics Regulation, entry 289).

(6) The overall migration limits of lead as defined in Division III (13) of Annex II to Directive 2009/48/EC and reduced by Directive 2017/738/EG may not be exceeded in toys and parts of toys.

(7) The use in colours of lead carbonate (2006/1907/EC, REACH Annex XVII, entry 16) and lead sulphate (2006/1907/EC, REACH Annex XVII, entry 17) is generally prohibited. The Chemicals Prohibition Ordinance (Chemikalien-Verbotsverordnung - ChemVerbotsV) defines exceptions in section 4(2).

(8) Lead in packaging may not exceed 100 ppm by weight cumulatively after 30 June 2001 (Directive 94/62/EC).

7 Employment restrictions

(1) Employment restrictions for activities involving lead and lead compounds are to be observed for specific groups of persons. This applies in particular to:

1. Young people:

According to the Act on the Protection of Young People at Work (Jugendarbeitsschutzgesetz), young people may not be employed in work where they are exposed to harmful effects caused by lead and lead compounds within the meaning of the Hazardous Substances Ordinance. Under certain conditions, the employment ban does not apply to such work where employment is necessary to achieve a training objective.

2. Women who are pregnant or breastfeeding:

Under the Act on the Protection of Working Mothers (Mutterschutzgesetz), activities involving lead and lead compounds and working conditions in which workers are or may be exposed to lead and lead compounds pose an irresponsible risk to a pregnant or breastfeeding woman or to her child, insofar as there is a risk that these substances may be absorbed into the body. The employer may not entrust such activities to a pregnant or breastfeeding woman, nor may he allow her to engage in such activities or to expose her to such working conditions.

Annex 1 to Technical Rule for Hazardous Substances 505

Guidance on the selection and implementation of protective measures and documentation in the risk assessment

(1) In the context of the risk assessment, the employer has to develop a company-specific, systematic approach to minimise exposure to lead and lead compounds and to progressively reduce individual contamination and comply with the biological limit value.

(2) The following priority areas can be used as guidance for company procedures. It is recommended to coordinate the procedure with the responsible occupational safety and health authority.

1. Statement of the current situation
    a) A description of the company's operational areas involving exposure,
    b) documentation of the substitution check (material and procedural),
    c) description of the existing protective measures for the individual areas and activities (in line with the order of priority in accordance with section 7 (4) of the Hazardous Substances Ordinance),
    d) description of the procedure, nature and results of the effectiveness check for technical protective measures (section 7 (7) of the Hazardous Substances Ordinance and No. 2.3 (7) of Annex I thereto),
    e) identification, analysis and assessment of current exposure for each activity and of the basic level of contamination in the areas concerned,
    f) presentation of any findings from preventive occupational health care (in compliance with medical confidentiality),
    g) presentation of the reduction of workers' contamination achieved so far and the measures that caused this reduction,
2. action to further reduce exposure
    a) determination of the state of the art for each activity,
    b) determination of the level of technical protection available and identification of the need for adaptation,
    c) definition of areas/activities to be addressed, depending on the duration and level of exposure,
    d) priority implementation of the best practices for comparable activities (see Annexes 2 and 3 to the present Technical Rule for Hazardous Substances),
    e) ensuring the functionality and effectiveness of technical protection measures through periodic inspections,
    f) selection and implementation of organisational and personal protective measures, including measures for a systematic cleaning of areas and facilities and a comprehensive system of personal hygiene,
    g) involvement of the workers concerned and their representatives in the planning and implementation of the measures by providing regular information and instruction with a view to achieving active personal participation by all workers,
    h) involvement of the occupational physician and taking into account findings from preventive occupational health care in the framework of the risk assessment and the provision of information to workers,
    i) ensuring that all workers concerned receive individual, personal advice and support from an occupational health physician throughout the entire process,
    j) documentation of the measures to be taken in the future, specifying the periods during which the measures are to be implemented.

Annex 2 to Technical Rule for Hazardous Substances 505

Detailed technical and construction measures as well as other protective measures and rules

(1) This Annex contains detailed technical and structural measures as well as further protective measures and rules for the relevant activities involving hazardous substances containing lead referred to in division 4 of this Technical Rule for Hazardous Substances.

(2) Divisions 4.4 to 4.7 of this Technical Rule for Hazardous Substances describe the measures to be applied to all 30 activities referred to in division 3 of this Technical Rule for Hazardous Substances. This Annex contains a matrix with further measures and codes of conduct specifically assigned to the relevant activities referred to in division 3 by an “X” due to the differences between them. These measures are to be applied as a matter of priority for each activity unless it can be demonstrated that the protection objective is achieved by other measures, also when taking into account more recent findings. In the case of work that cannot be assigned to any of the 30 activities, the measures and codes of conduct listed in the table should be examined with regard to their feasibility in the context of the risk assessment.

The relevant activities listed in division 3 of this Technical Rule for Hazardous Substances are listed below to facilitate the readability of the matrix of this Appendix:

1. melting of lead ore and lead concentrates (primary melting of lead);
2. recycling of lead waste and secondary raw materials (primary/secondary lead melting);
3. refining of lead,
4. transporting, storing and stacking of lead in bars, sheets, rods, used batteries, etc.,
5. loading and driving away lead dross, ashes or other dusty material as well as emptying the containers;
6. handling and loading of lead compounds in closed containers;
7. production and processing of lead bronze, lead pigments, lead glazes, lead powder and dusting lead compounds;
8. use of powdered lead compounds in the manufacture of paints (restoration), electronic components (piezoceramics), sintered parts, accumulators and plastic objects,
9. melting and casting lead and lead alloys,
10. manufacture, transport and installation of charge carriers in the accumulator industry,
11. production, melting and casting of lead alloys such as free cutting steel, copper alloys, etc.,
12. machining lead and lead alloys by mechanical processes (e.g. grinding, brushing, polishing and blasting) or thermal processes,
13. heat treatment of steel wires and strips,
14. homogeneous lead coating,
15. manufacture of lead projectiles,
16. repair, cleaning and revision work in sectors where lead is produced, processed or used,
17. soft soldering with lead solders,
18. manufacture and working of organ pipes,

19. the use of lead for bending bells for the manufacture of brass instruments,

20. roof coverings with lead materials,

21. painting of glass, lead glazing (especially when restoring historical lead glazing),

22. applying of lead decorative paints on enamel, glass and ceramics in the form of pastes or solidified thermoplastics,

23. processing of pastes with lead pigments and lead decorative paints as screen print pastes or thermoplastics,

24. preparing and inserting lead glass mixtures,

25. applying lead-based paints (restoration) or other lead-based products in spray procedures,

26. using lead-based explosives (ammunition and special explosive material), monitoring of shooting drill with lead ammunition and cleaning places (including shooting ranges) where lead materials were used,

27. removal of lead-containing coatings, e.g. by burning off, by abrasive processes (e.g. brushing, grinding, polishing, blasting and needling) or by paint stripping,

28. removing lead components or lead containing building materials during the renovation or demolition of buildings,

29. welding and flame cutting of metal parts with lead coatings,

30. disassembly of lead-containing waste equipment (e.g. electrical and electronic equipment).

Activities / **Protective measures**	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17 [f]	18	19	20	21	22	23	24	25	26	27 [a]	28 [a]	29	30
Technical measures in indoor areas/working areas																														
Sources of lead dust on machinery and equipment are to be encapsulated or, where possible, enclosed.	x	x	x				x	x	x	x	x	x	x	x	x				x								x		**See [g]**	x
Use of closed ovens with dust extraction system.	x	x	x				x			x	x		x		x				x											
Use of secondary hoods for furnace operations such as feeding or tapping.	x	x																												
Lead-containing precursors, intermediate or final products and waste are to be transported as dust-free as possible.	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x		x	x					x	x		x	x		x
Use of wet and dry sweepers.	x	x			x	x	x	x	x	x	x			x		x		x												x
Permanently lead contaminated workstations must be connected to stationary exhaust systems (e.g. German Statutory Accident Insurance rule 109-002).	x	x	x		x	x	x	x	x	x	x	x	x	x	x			x	x				x	x		x	x			x
In working areas, stationary or mobile exhaust systems are to be provided (dust class “H” according to DIN EN 60335-2-69).	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x		x		x	x	x	x		x	x			x
Ventilation systems must ensure that workers can breathe uncontaminated fresh or purified recirculated air (in accordance with section 10 of the Hazardous Substances Ordinance).	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x		x		x	x	x	x	x	x	x			x
The air is to be fed to the workstations in a targeted manner and, where possible, without any draft effects (Laminar Flow Cabinets).	x	x	x		x	x	x	x	x	x	x		x	x	x				x			x	x	x						x
Changing rooms, washing rooms and break rooms are to be equipped with ventilation systems that produce a slight overpressure as compared to the working areas.	x	x	x		x	x	x	x	x	x	x			x		x						x	x						
Rubbish bins etc. for lead-containing waste are to be covered and, where possible, connected to exhaust systems.	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x			x			x	x	x			x			x
In order to minimise diffuse lead dust emissions, measures such as moistening floor areas and dusting materials in working areas, should be considered and, if possible, implemented.	x	x			x		x	x	x	x	x	x		x		x									x		x			x
In addition, the use of floor grids with water-filled tubs to minimise diffuse lead dust emissions at the workplaces should be considered.							x	x	x	x	x	x	x	x																
Cleaning places for industrial trucks are to be provided	x	x	x		x	x	x	x	x	x	x			x		x														x

Activities / **Protective measures**	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17 [f])	18	19	20	21	22	23	24	25	26	27 [a])	28 [a])	29	30
Measures in outdoor areas																														
Regular spraying of water and wet cleaning of sealed open spaces where materials containing lead are handled.	x	x			x	x																								
Sealing green spaces.	x	x		x	x	x																				x	x			
Optimisation of transports and compulsory route concept for vehicles.	x	x		x	x	x																								
Use of wet sweepers for road and floor cleaning.	x	x		x	x	x				x																				
Minimising the drop speed or free fall height of materials and minimising other transport speeds when dust-containing materials are moved.	x	x			x																									x
Washing the wheels and the bodies of vehicles that deliver or handle lead containing materials.	x	x		x	x	x																								
Speed limits on the plant premises.	x	x		x	x	x				x																				
Minimising transport distances.	x	x	x	x	x	x		x		x																				
Construction measures																														
Closed factories without wind attack points.	x	x	x		x		x	x	x	x				x																
Fast locking automatic factory gates or locks.	x	x	x		x		x	x	x	x				x	x				x											
Inclining floors in the direction of collection troughs.	x	x		x	x	x		x	x	x				x																
Easy-to-clean wall and floor areas.	x	x	x		x	x	x	x	x	x	x			x					x		x	x	x	x		x			x
Spatial separation[b]) of working areas with high and low exposure.									x	x				x												x			
Spatial separation[c]) of working areas with high and with low exposure.	x	x			x						x	x	x					x								x	x		x
Cleaning tracks for outgoing vehicles or separation of “indoor” and “outdoor” vehicles have to be provided in highly contaminated areas.	x	x		x	x																								
Additional organisational measures																														
Floors in working areas must be cleaned wet at least daily (e.g. with wet sweepers).	x	x	x		x		x	x	x	x	x			x	x	x			x		x	x	x	x					

Protective measures / **Activities**	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17 [f])	18	19	20	21	22	23	24	25	26	27 [a])	28 [a])	29	30
Workplaces must be cleaned regularly in accordance with the risk assessment. Cleaning must be checked by a person designated by the employer.	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x		x	x			x
Buildings and installations such as piping and cable routes are to be vacuumed at reasonable intervals based on the prevalence of dust deposits.	x	x	x		x		x	x	x	x	x			x	x	x		x	x										x
Wipe samples in break rooms to check proper cleaning [d]).	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x		x	x								x	x		x
Additional measures for personal hygiene																														
The success of personal hygiene measures (see division 4.7 of Technical Rule for Hazardous Substances 505) can be proven and illustrated by spray tests on hands and arms[e]).	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			x			x	x		x

[a]) With regard to work involving lead exposure on construction sites Annex 3 is to be observed as well. When removing lead coatings by paint stripping in the framework of renovation measures on construction sites, appropriate process- and substance-specific criteria must be observed.

[b]) Spatial separation means the complete separation of rooms, i.e. not only through side walls, but fully enclosed and with technically dense walls, floors and ceilings.

[c]) Spatial partitioning can be achieved, for example, by mounting individual walls, movable walls, industrial curtain systems. Individual areas of the room remain connected. As a rule, these partitions are used in combination with exhaust and/or ventilation measures.

[d]) wipe samples: an absorbent white paper towel is sprayed with 3% acetic acid. The area to be checked is then wiped with the paper towel. The paper towel is then sprayed with a 5% potassium iodide solution. Yellowing indicates lead contamination.

[e]) Skin spray test: Interested members of staff may be offered a voluntary skin spray test. The chemicals used in this process are not classified as hazardous. The arm, wrist and hand area to be tested is sprayed with 3% acetic acid. The skin areas are then sprayed with a solution of <1% potassium iodide. Yellowing indicates lead contamination. In the case of yellowing, skin areas must be thoroughly cleaned. The test must then be repeated until yellowing no longer occurs.

[f]) Technical Rule for Hazardous Substances 528 “Welding work” and process - as well as substance-specific criteria in German Statutory Accident Insurance Information 213-714 “Manual piston soldering with lead solder alloys in the electrical and electronic industries” have to be observed as well.

[g]) Welding and flame cutting of metal parts with lead coatings may not be carried out without prior removal of the coatings. In the context of substitution, lead coatings must be removed with the help of processes involving minimal exposure before welding and flame cutting can begin (see activity no. 27 and Annex 3). After removal of the lead coatings, the protective measures of Technical Rule for Hazardous Substances 528 are to be applied to flame cutting and welding.

Annex 3 to Technical Rule for Hazardous Substances 505

Removal of lead surface coatings on construction sites

1 General information

(1) The removal of surface coatings (decoating activities) with the help of different procedures is one of the activities frequently carried out in various industries. Often, coatings contain lead or lead compounds in order to prevent rust or they occur as colour pigments.

(2) As part of the risk assessment, other hazardous substances must be taken into account during decoating activities if they can be released as part of a surface coating or as a result of the process (e.g. due to heating). These may include polycyclic aromatic hydrocarbons (PAHs), asbestos, chromium (VI) compounds or quartz dust. Guidance on how to deal with such cases can be found in the relevant set of rules, in particular Technical Rule for Hazardous Substances 524 “Contaminated areas”.

(3) If activities are carried out in accordance with process- and substance-specific criteria pursuant to Technical Rule for Hazardous Substances 420, it can be assumed that the requirements of the Hazardous Substances Ordinance for the protection of workers are met (e.g. when applying the paint stripping process for removing lead coatings on wood and when preparing for re-coating as part of renovation measures on construction sites).

(4) In the following guidance on risk assessment information is given, in particular on the presence of lead surface coatings, on decoating procedures used in practice, special construction site conditions and possible protective measures to minimise exposure.

2 Presence of lead coatings

(1) While red lead was used as rust protection, white lead and lead chromate were used as colour pigments and organic lead compounds as siccatives. The content of lead and lead compounds as a rust protection coating or in opaque paint coats can be up to several hundred grams per kilogram of paint.

(2) Such coatings may occur in particular on

1. steel structures (factory and roof structures),
2. bridges (including suspension ropes),
3. ship hulls and frames,
4. transmission towers and catenary supports,
5. hydraulic steel structures (e.g. lock gates and installations, weirs),
6. wooden components (e.g. windows and doors),
7. door frames.

3 Decoating procedures applied

(1) The decoating procedures have to be chosen depending on the type, location, quality and thickness of the layer to be removed, the underground (basic material), the ambient conditions and other hazards.

(2) The following applies in particular to the decoating of lead surface layers:

1. blasting (e.g. dry blasting, wet blasting, high pressure water blasting, suction head blasting),
2. pinning,
3. mechanical cleaning (e.g. brushing, grinding),
4. thermal processes (heating with simultaneous or subsequent removal of the coating) e.g. by burning with an open flame, heating with hot air or infrared heaters,

5. stripping,
6. inductive process (heating of the basic material).
7. In principle, preference should be given to procedures involving as little exposure as possible.

4 Special conditions on construction sites

(1) Compared to stationary workplaces, construction sites are generally characterized by special conditions as regards exposure and the possibility of using protective measures.

(2) Such conditions include:

1. The possibility of the spread of aerosols (dusts, smokes, fogs) and vapours to the environment (wind direction and wind conditions have to be observed),
2. possible contamination of surrounding soil areas and waters,
3. spread of contamination by work equipment and aids (e.g. platforms, scaffolding, tarpaulins, films, vehicles),
4. spread of contamination by contaminated clothing in the interior of vehicles;
5. coordination of activities and trades with regard to emerging hazards and necessary protective measures.

5 Possible protective measures

In principle, all activities involving exposure to lead or lead compounds on construction sites are governed by the procedure and measures set out in this Technical Rule for Hazardous Substances if they can be applied. The measures listed below have proved their worth in practice. Depending on the outcome of the risk assessment, a selection of these measures may be sufficient to protect workers, or supplementary measures may be necessary.

5.1 Planning and installing

In order to ensure a high level of effectiveness of the protective measures, these must be taken into account during the planning phase of the activities and when setting up a construction site:

1. If a work and safety plan has been drawn up in accordance with the Technical Rule for Hazardous Substances 524 for the planned measures, this plan must be taken into account in the risk assessment,
2. Determination of the black zones, the spreading areas and the floor areas to be completely covered,
3. Determination of the dividing line between the black and the white zone (structural characteristics and codes of conduct),
4. Installation of utilities and communal facilities (emergency assembly point, e.g. containers to be used as changing rooms, showers, occupied areas) outside the spreading areas. The distance from the workplace to the assembly point should be planned in such a way as to ensure that the assembly point is within walking distance (avoidance of the spreading of contamination by vehicles),
5. Setting up break zones, in this context care should be taken to choose a protected position (in the shadow, at a safe distance from the working areas, wind direction and hygiene),
6. Black zones are to be established with dust-proof enclosures where possible when abrasive processes involving exposure are used. The static of the object to be processed is to be taken into account, so that at least the horizontal areas (e.g. floor cover or collecting shafts) are to be constructed with dustproofness. If, for structural reasons, vertical areas have to be designed to be air-permeable, suitable protective measures

must be taken to collect the particles. E.g. in the case of pinning, protective nets with a mesh size of 400 µm in the base tissue has proved their worth as vertical partitioning,
7. defining the material flows (feeding, removal of blasting agent, transport/storage and disposal of contaminated waste),
8. if lead-containing coatings cannot be completely removed, their nature and location is to be documented and the information is to be provided for e.g. a competent risk assessment by subsequent trades,
9. selection and definition of the necessary PPE depending on the procedure applied, the type and level of exposure, including making arrangements for storage, cleaning and maintenance,
10. use of qualified workers only and/or of workers who have at least received special instructions,
11. setting up a cleaning plan,
12. setting up a hygiene plan.

5.2 Operation

(1) The protective measures must be checked every working day before the start of the activities with regard to their function and effectiveness by a qualified person, e.g. integrity/tightness of the enclosure and the function of the air duct. It is recommended to document the test results.

(2) The air flow must be conducted in such a way that

1. The air flow must be such that an even flow through the black area, e.g. by suitable mesh size of the vertical areas of the enclosure is ensured,
2. released hazardous substances are disposed of,
3. climate factors and
4. specific conditions of the decoating process used are to be taken into account.

(3) If processes (e.g. pinning) are used in a closed black zone that do not lead to an additional entry of working materials (e.g. blasting agents), at least five times the air change in the black area may be sufficient. The purified air must not be returned to the working area.

(4) Under certain weather conditions (e.g. high outside temperatures) and when wearing PPE (particularly radiation protection suits), workers can experience very high thermal loads (see German Statutory Accident Insurance information 213-002 "Heat work - Recognize Assess Protect").

(5) These risks are to be taken into account in

1. the selection of the materials of the black zone (enclosure),
2. the selection of staff,
3. measuring the length of stay in the black zone and
4. the organisation of work (working time - break regime).

(6) At regular intervals and when required, all work equipment, tools, equipment, contaminated surfaces, etc. must be cleaned (extracted with a duster of at least dust class “H” according to DIN EN 60335-2-69 or a device with an equivalent level of separation or wet-cleaning).

5.3 Measures following completion of the decoating or renovation activities

(1) After completion of the decoating activities, it is important not to leave any dirt or contamination at the workplace or the work area and thus to avoid endangering subsequent

trades, third parties or the environment.

(2) Facilities and equipment are to be cleaned as far as possible, within the black zone so that adjacent areas are not contaminated by the spread of lead substances.

(3) Facilities and equipment may be kept, transported and stored outside the black zone only in a cleaned state. If this is not possible, storage outside the white zone is permitted only in a fully covered state.

(4) After completion of the decoating or renovation activities, the ground cover should be cleaned prior to departure by, for example, vacuuming. If this is not possible, the covers must be packaged as dust-free as possible and then properly cleaned or disposed of.

(5) Waste from the removed coating must be collected, stored dustproof in suitable containers and disposed of in accordance with the specifications of the local waste disposal facilities.

Annex 4 to the Technical Rule for Hazardous Substances 505
Model operating instructions in accordance with the Hazardous Substances Ordinance

Company: John Doe company
Area of work: Pre-production
Responsible: John Doe

OPERATING INSTRUCTIONS

pursuant to the Hazardous Substances Ordinance
Workplace: Lead pasting workstation
Activity: Production of electrodes

as at: X.XX.XXXX

Name of the hazardous substance

Lead and lead compounds

Hazards for humans and the environment



- Lead paste and dust are harmful to health when inhaled and swallowed. Risk of lead accumulation in the body.
- Lead can damage the unborn child. Affects the fertility of women and men.
- Harmful to aquatic organisms.



Protective measures and codes of conduct









- Do not inhale dust. Avoid dust formation. Dust on floors, machinery and equipment is to be removed by vacuuming or wet wiping all surfaces at least daily.
- At the beginning of work: Check extraction system and keep covers closed.
- At the end of the shift: Clean machinery properly.
- Wear prescribed respiratory protective equipment (type ….).
- Wear personal protective equipment provided (safety shoes, disposable gloves, protective gloves, prescribed working clothes and apron).
- Observe strict personal cleanliness. Don't touch your face with dirty hands.
- It is prohibited to bring food and personal items (tobacco, mobile phone, watch, etc.) into the working area. Store personal belongings in a compartment of the locker in the break room.
- Clean your face and hands thoroughly before eating or drinking and before smoking and rinse out your mouth with water. Use skin protection products.
- Use spray test to find out whether your hands and arms are free from lead.
- Change working clothes daily and shower at the end of shift.





Behaviour in case of danger



- In the event of the emission of lead fumes caused by fire or high dust pollution, leave the hazardous area immediately and go to the assembly point.
- Inform superior.
- Attempt to extinguish the fire with the help of fire extinguishers (foam). (specify location)
- Emergency call

First aid



- If dust or paste has come into your eyes, rinse out eyes with plenty of water.
- Make sure to move to fresh air after inhaling fumes or dust.
- Drink plenty of water after swallowing [lead] and see a doctor right away.
- Take off polluted clothing, clean your skin and face. Shower.
- Inform superior.
- Emergency call

Proper disposal



- Lead waste is a valuable raw material that is recycled.
- All materials and dust containing lead are to be collected in the appropriate containers.
- The containers must be lined with film and sealed before transport.
- Materials containing lead must not get into hand washbasins or street drains.

References to literature

[1] Hazardous Substances Ordinance (Gefahrstoffverordnung - GefStoffV)

[2] Industrial Safety Ordinance (Betriebssicherheitsverordnung - BetrSichV)

[3] Directive 98/24/EC of 7 April 1998 of the Council on the Protection of the Health and Safety of Workers from the Risks related to Chemical Agents at Work (fourteenth individual directive within the meaning of Article 16 (1) of Directive 89/391/EEC)

[4] Ordinance on Preventive Occupational Medical Prevention (Verordnung zur arbeitsmedizinischen Vorsorge - ArbMedVV)

[5] Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC and amending Regulation (EC) No 1907/2006

[6] Explanatory statement for lead in TRGS 903: Lead and inorganic lead compounds, October 2017 edition (Blei und anorganische Bleiverbindungen, Ausgabe Oktober 2017)

[7] Occupational Medical Rule 3.2, Occupational Health Prevention (Arbeitsmedizinische Prävention)

[8] Occupational Medical Rule 6.2, Biomonitoring (Biomonitoring)

[9] Occupational Medical Rules 6.4, Notifications to the employer pursuant to section 6 (4) of the Ordinance on Preventive Occupational Healthcare (Mitteilungen an den Arbeitgeber nach § 6 Absatz 4 ArbMedVV)

[10] Occupational Medical Rule No. 14.2, Classification of respiratory protective devices into groups (Einteilung von Atemschutzgeräten in Gruppen)

[11] German Society for Occupational Medicine and Environmental Medicine S1 Guideline (DGAUM S1 Leitlinie): Prevention and early detection of work-related health risks in activities involving lead and its inorganic compounds (excluding lead arsenates, lead chromates) (Prävention und Früherkennung arbeitsbedingter Gesundheitsgefährdungen bei Tätigkeiten unter Einwirkung von Blei und seinen anorganischen Verbindungen (außer Bleiarsenate, Bleichromate)

[12] German Statutory Accident Insurance Information 213-573 (DGUV Information 213-573): Analytical method for the determination of lead and its inorganic compounds (Analyseverfahren zur Bestimmung von Blei und seinen anorganischen Verbindungen)

[13] German Statutory Accident Insurance Rule 112-190 (DGUV Regel 112-190): Use of respiratory protective devices (Benutzung von Atemschutzgeräten)

[14] German Statutory Accident Insurance Rule 109-002 (DGUV Regel) 109-002: Workplace ventilation – ventilation measures (Arbeitsplatzlüftung − Lufttechnische Maßnahmen)

[15] Eurobat Blood Lead Mitigation Program 2017

[16] ILA Blood Lead Mitigation Program 2017

[17] TRGS 460: Recommended course of action for determining the state of the art (Vorgehensweise zur Ermittlung des Standes der Technik)

[18] TRGS 528: Welding work (Schweißtechnische Arbeiten)

[19] TRGS 555: Working instruction and information for workers (Betriebsanweisung und Information der Beschäftigten)

[20] Process- and substance-specific criteria (Verfahrens- und stoffspezifische Kriterien - VSK*): Application of the paint stripping process for removing lead coatings on wood and preparing for subsequent re-coating in the context of renovation measures at construction sites (2016) (Anwendung des Abbeizverfahrens für das Entfernen bleihaltiger Beschichtungen auf Holz und die Vorbereitung für die anschließende Neubeschichtung im Rahmen von Sanierungsmaßnahmen auf Baustellen (2016)

[21] Process- and substance-specific criteria (Verfahrens- und stoffspezifische Kriterien - VSK*): Plastics recycling activities involving hazardous substances and biological agents in plastics recycling (2013) (Kunststoffverwertung-Tätigkeiten mit Gefahrstoffen und biologischen Arbeitsstoffen bei der werkstofflichen Verwertung von Kunststoffen (2013))

[22] Process- and substance-specific criteria* (Verfahrens- und stoffspezifische Kriterien - VSK*): German Statutory Accident Insurance Information 213-714 manual piston soldering with lead solder alloys in the electrical and electronics industry (DGUV Information 213-714 Manuelles Kolbenlöten mit bleihaltigen Lotlegierungen in der Elektro- und Elektronikindustrie)

[23] Occupational accident insurance funds recommendation for preventive occupational health screening E 2 “lead or its inorganic compounds” (Berufsgenossenschaftliche Empfehlung für arbeitsmedizinische Vorsorgeuntersuchungen E 2 „Blei oder seine anorganischen Verbindungen“)

[24] Glossary relating to the regulations of the Industrial Safety Ordinance, the Biological Agents Ordinance (Biostoffverordnung - BioStoffV) and the Hazardous Substances Ordinance (Gefahrstoffverordnung GefStoffV) https://www.baua.de/DE/Angebote/Rechtstexte-und-Technische-Regeln/Regelwerk/Glossar/pdf/Begriffsglossar.pdf?__blob=publicationFile&v=2

[25] DIN EN ISO 13982-1:2011-02 “Protective clothing against solid particles – Part 1 (DIN EN ISO 13982-1:2011-02 „Schutzkleidung gegen feste Partikeln – Teil 1): Performance requirements for chemical protective clothing that protects the entire body against airborne solid particles (type 5 clothing) (Leistungsanforderungen an Chemikalienschutzkleidung, die für den gesamten Körper einen Schutz gegen luftgetragene feste Partikeln gewährt (Kleidung Typ 5)”

[26] DIN EN 13982-2:2005-03 “Protective clothing against solid particles – Part 2 (DIN EN 13982-2:2005-03 „Schutzkleidung gegen feste Partikeln – Teil 2): Test method for determining the internal leakage of small particle aerosols by protective suits (Prüfverfahren zur Bestimmung der nach innen gerichteten Leckage von Aerosolen kleiner Partikel durch Schutzanzüge”

* process - and substance-specific criteria are standardised working procedures recognised by the Hazardous Substances Committee in accordance with TRGS 420.